INTRODUCTION

The main objective of this project was to obtain information concerning the amphibian and reptile populations on Craig Mountain. Up until 1992 Craig Mountain has been private property, so we knew little about the distribution and relative abundance of amphibians and reptiles within this area. Information concerning the distribution, relative abundance, and habitat associations of amphibian and reptile species on Craig Mountain is important for four main reasons. First, such information is needed to properly manage amphibian populations, especially sensitive species, such as the Spotted Frog (*Rana pretiosa*), Tailed Frog (*Ascaphus truei*) and Ringneck Snake (*Diadophis punctatus*), which are found on Craig Mountain. Second, information about amphibians is important because of the decline in many populations of true frogs and true toads in western North America. Third, some amphibians are very sensitive to pollutants, and may serve as indicators of environmental quality (e.g., riparian areas) (Wake and Morowitz 1990). Finally, data gathered from this project are of value in testing and refining the Idaho Gap Analysis models for amphibian and reptiles.

The specific objectives of this study were to: (1) determine the distribution of amphibians and reptiles, (2) estimate the relative abundance of amphibians and reptiles, (3) determine the habitat associations of amphibian and reptiles, and (4) identify potential sites for long-term monitoring of amphibian populations. To accomplish these objectives, we gathered distribution, relative abundance, and habitat data using a variety of sampling techniques during the spring and summer of 1994 and 1995. We used many sampling techniques because the amphibian and reptile species there are diverse in their ecological requirements. For example,

visual surveys for pond dwelling amphibians are not the best technique for locating grassland snakes.

METHODS

Sources of information

By including information from several sources, wildlife surveys can be strengthened. To determine the distribution, relative abundance and habitat relationships of amphibians and reptiles on Craig Mountain, we utilized the following information.

1. Published accounts - We searched published literature for accounts indicating which species might have occurred on CM (e.g., Nussbaum, Brodie and Storm 1983, and Stebbins 1985).

2. Museum records - We searched the Northern Intermountain Herpetological Database at the Idaho Museum of Natural History for amphibian and reptile specimens collected from CM. This computerized database was generated from information requested from over 100 North American museums and Natural History collections. There were no museum records for Craig Mountain before the study.

3. Additional observations - We interviewed individuals familiar with Craig Mountain for their observations of amphibians and reptiles. These individuals included Idaho Department of Fish and Game (IDFG) personnel, land owners, and recreational users. We also utilized incidental observations collected in 1993 by an IDFG wildlife biologist. For IDFG personnel, we conducted workshops on identifying amphibian and reptile species to increase the accuracy of contributed observations.

4.) Field surveys - during the spring and summer of 1994 and 1995, we conducted field surveys for amphibians and reptiles on Craig Mountain. Field surveys yield the most information concerning habitat associations and animal abundances, and allow for the collection of valuable incidental and anecdotal information (e.g., observation of predation or potential hibernation sites) (Clark et al., 1993). Craig Mountain has not been previously described in literature, so field surveys were especially important.

Study Area

Craig Mountain consists of about 60,000 acres (21,900 hectares) and is located approximately 12 miles (19 km) south of Lewiston, Idaho (Figure 1). It is bordered by the Snake River and Hells' Canyon Recreational Area to the west and the Salmon River to the south (Figure 2). Craig Mountain is characterized by a high elevation "plateau" 5100 ft. (1555 m) of Grand Fir (*Abies grandis*) and Douglas

Fir (*Pseudotsuga menziesiei*) with wet meadows of *Carex* and *Juncus spp.* dispersed throughout the area. The elevation drops steeply into breaks of native and exotic grasslands and coniferous and riparian draws. The steep breaks end at the Snake and Salmon Rivers at 800 ft. (274 m), which is the lowest elevational area of CM. The riverine habitat is characterized as a rocky grassland with hills that rise to meet the basaltic cliffs and talus slopes.

Craig Mountain was purchased by the Bonneville Power Administration (BPA) in 1992 as partial mitigation for wildlife habitat losses associated with the construction of Dworshak Reservoir on the North Fork of the Clearwater River. According to agreements made between BPA, IDFG, and the Nez Perce Tribe, wildlife managers are identifying mitigation activities and developing monitoring plans to evaluate the effects of these proposed mitigation activities.

Site Selection

Survey site selections varied temporally and spatially depending on the individual sampling technique. For amphibian breeding surveys, we sampled all ponds we could locate. Streams with appropriate habitat were surveyed for Tailed Frogs. To determine other CM creeks to survey (i.e, Deer and Maloney Creek), we studied aerial photos and talked with biologists familiar with CM. Creeks with some canopy cover were given priority for surveying over open, dry or grazed creeks. The 1994 drift fence design and locations were primarily selected for trapping small mammals, so reptile success rate was low (see Cassirer 1995). But, Long-toed salamanders, Western Toads and Spotted Frogs were successfully trapped in pitfalls in the wet meadow habitats. In 1995, for our drift fence and funnel trap arrays, we chose representative lower elevation habitats (riparian and talus-grassland). Along the Salmon River, at our habitat choice was limited because traps could not be exposed for fear of vandalism. Large *Carex* wetlands were chosen for night calling surveys because of the quality of the habitat for treefrogs and road logistics. Along the upper elevation, major roads were driven for night road surveys, in conjunction with calling surveys. All drivable roads at the lower elevation habitat were sampled. In the

late spring, it was necessary to walk the Snake River Road instead of driving because the annual grasses were too high to see over. The areas chosen for the 1995 terrestrial surveys were dependent on road logistics and accessibility. Also, to survey underrepresented areas, especially the steep grassland breaks.

Sampling Techniques

The amphibian and reptile species on Craig Mountain occupy diverse ecological habitats (ponds, streams, meadows, grasslands). Because of this diversity, no single sampling technique is effective for all species. Consequently, we used a variety of techniques, including: (1) visual searches of potential breeding sites in still or slow-moving water; (2) searching streams for amphibians, especially Tailed Frogs (*Ascaphus truei*) and Idaho Giant Salamanders (*Dicamptodon aterrimus*), (3) using drift fences (with pitfall and funnel traps) and coverboards; (4) visual surveys of terrestrial and grassland reptile species in rocky and talus areas, (5) nighttime road driving; (6) calling surveys at night; and (7) incidental observations (Figures 3a and 3b).

Amphibian Breeding Site Surveys

In 1994, we surveyed 53 potential breeding sites. We were able to locate these by using personal observations, USGS topographic maps, recommendations from IDFG personnel, U.S. Fish and Wildlife Service (USFWS) National Inventory Wetland maps, and draft Idaho Gap Analysis maps for amphibians and reptiles. We defined a potential breeding site as a body of water that either had amphibians breeding, and/or dimensions of at least $1m^2$. If a feature did not have its own name, we gave it our own name

In 1995, we revisited 51 out of the 53 wetlands located in 1994, and found three additional ponds. Out of the 54 ponds, 29 are human-influenced (e.g., roads cutting through wetlands), 7 are man-made (private ponds, reservoirs, and stock ponds) and 18 are natural. Almost 80% of the 55 ponds occur at elevations ranging from to 4100 to 5100 ft. (1250 - 1555 m). For the 1994 surveys, we sampled all wetland sites a minimum of two times, at least once in the spring (April or May) and once in the summer

(June or July). The number of sampling visits per site ranged from 2 to 9 visits, with an average of three visits. All breeding site sampling occurred between 0800 and 1700 hours. For 1995 surveys, all conditions were the same except the number of visits ranged from one to three (See Appendix A).

Physical description. During the first visit to a wetland site, we recorded locality data, elevation, and a drawing of the general terrain. At the time of each sampling, we recorded the weather conditions (air temperature, wind speed, precipitation, and percent cloud cover).

Most UTM coordinates were determined from topographic maps, except for a few measured with a Trimble Basic Plus GPS receiver (Trimble, Sunnyvale, CA). We determined coordinates to within +/- 5 m about 200 readings per site, differentially corrected (base files from McCall, Idaho) and then averaged.

Water chemistry. Also, during each visit to a locality, we measured the water temperature, pH and conductivity. Water temperature was measured no more than 1 m from shore, at a depth of 1 cm for approximately two minutes using a mercury thermometer. Water pH was measured with a Phep+ pocket pH meter (Forestry Suppliers, Jackson, Mississippi) which had a resolution of 0.2 pH. Conductivity was measured using a DiSt 3 ATC pocket dissolved solid tester (range 10-1990μS, accuracy ±2%) (Forestry Suppliers, Jackson, Mississippi). Both meters were calibrated every 3 to 4 days with standardized chemical solutions. Water chemistry data for certain dates are unavailable because of some technical difficulties with the equipment.

Biological Description. During each visit to a wetland area, we recorded information concerning the dominant vegetation type(s), the percentage of emergent vegetation, evidence of grazing or other human activities, and the presence of potential predators for amphibians (e.g., snakes, fish or birds) and UTM coordinates taken at the north edge of each site. We described each site using a standard form developed by Dr. Paul Stephen Corn of the National Biological Service (Figure 4).

The principal sampling technique for amphibians consisted of timed visual searches. We walked in the water and/or along the shores of ponds, along the banks of streams, and through other

wetlands. Because adult Spotted Frogs can scare easily, we would slowly approach a pond, while looking for basking frogs along the shore. We counted the total number of egg masses found, all the individuals seen, and categorized them as adults, juveniles, recent metamorphs, or larvae. In the case of large numbers of larvae or metamorphs, we only estimated their numbers. Occasionally, tadpoles or egg masses were unidentifiable, so we allowed them to develop in captivity until identification was verified. We also listened for the advertisement calls of adult anurans during the surveys.

Stream Surveys

In 1994 we surveyed sections of five permanent streams that occur on Craig Mountain, including two streams in which fish biologists found Tailed Frogs in 1993. The streams we surveyed for amphibians included: (1) Captain John Creek- from NW of Benton Meadows south; (2) West Fork Deer Creek- from Benton Meadows to Deer Creek confluence at Larabee Meadows; (3) Eagle Creek- two sections: where the creek runs parallel with Zaza Road, and where the creek meets Eagle Creek Road, heading west for approximately 2 miles; (4) China Creek- Salmon River Rd., north for one mile; and (5) Wapshilla Creek- from Wapshilla ranch north for 1 mile. We visited these sites 1-2 times each, from May through August of 1994.

Similar to the pond surveys, we collected associated data. These data included location (UTM coordinates) and a description of physical characteristics and habitat. We recorded some of the plants and animals present, and potential amphibian predators, such as fish, snakes, and birds. We also collected weather data as we did for the amphibian pond breeding surveys.

We visually searched for amphibians by walking through the stream looking into the water and under stream banks. The South Fork of Captain John Creek and the lower section of Eagle Creek have a rocky substrate and cold water. We searched these areas for adult Tailed Frogs (*Ascaphus truei*) and their tadpoles by turning over rocks while holding a dipnet downstream from the rocks. Tadpoles were fairly easy to spot in pools. We would stop at each pool and visually estimate the number of tadpoles and

measure a few of the tadpoles. All adult Tailed Frogs were measured and counted, whereas tadpole numbers were only estimated because of their large number. Specific location of the tadpoles and adults were not recorded with a GPS unit because the dense canopy coverage limited satellite reception. However, the UTM coordinates of the beginning and ending locations of streams searched where frogs were recorded from topographic maps.

The remaining creeks on the mountain were not considered Tailed Frog habitat because of their soil substrate, canopy coverage and/or habitat characteristics. We searched these streams by walking up the middle of the creek (when possible) and listening for adult frogs jump, and looking for Long-toed Salamander or Spotted Frog egg masses and/or tadpoles.

In 1995, we surveyed reaches of lower Deer Creek, Maloney Creek, Cottonwood Creek and Corral Creek. Sampling methods were similar to the 1994 surveys (See Appendix B).

Pitfall and Funnel Trapping, Coverboards

In 1994, IDFG biologists placed drift fences with pitfall traps in five habitat types: grassland (Idaho fescue - blue bunch wheat grass), white alder riparian, wet meadow, Douglas fir, and grassland invaded by yellow-star thistle. The drift fence and pitfall traps were primarily designed for small mammals and later modified for amphibians and reptiles. There were pitfall traps at all 15 sites (3 replicates for each habitat type) and two triad trapping arrays per site. The arms of the triads began 3 m from the center of the triad, and each arm had two #10 coffee cans buried on each end that served as the pitfall trap. UTM coordinates were determined for each site with a Trimble Basic+ GPS receiver. For each site, microhabitat variables (plant species, cover, distance to water, etc.) were measured once in July. Pitfall sampling for amphibians and reptiles were conducted from April 20 - May 12, 1994, traps were checked every 2-3 days.

After closing the pitfall traps, we attached funnel traps to 10 of the 15 sites (2 replicates per 5 habitat types). Both trapping arrays at each habitat site were used. We constructed funnel traps with fine

enough hardware cloth (1/8") to prevent the escape of small snakes. One 91 x 61 cm piece of hardware cloth yields one trap body (61 x 55 cm), one funnel (41 x 36 cm) and a door (15 x 23 cm). Two additional funnels measuring 41 x 37 cm were cut from pieces of hardware cloth (91 x 37 cm). We rolled the 61 x 55 cm pieces of hardware cloth into cylinders and fastened them together with 1/8" pop rivets. The 41 x 36 cm pieces were: rolled into funnels, pop riveted together, inserted into the ends of the trap bodies, and pop riveted into place. We then cut a doorway in the top of the trap and covered the edges with duct tape to prevent cutting ourselves or harming the animals when removing them from the trap. The door was secured to the trap body with wire. Hooks with rubber bands tied to the wire held the door shut. In the future, we would use elastic hair bands because they last much longer than rubberbands. A completed trap measures approximately 95 x 17 cm, varying slightly due to variations during assembly (Jonathan Beck pers. comm.). The traps were placed on the outside or inside end of the drift fence arms (3 per array, 6 traps per site).

In 1994, sampling was conducted from May 12 - July 8. We checked the traps every 3-4 days. In June, two portable drift fences (arms constructed of black plastic silt fencing) were on a Salmon River beach and along China Creek (riparian edge habitat). Each trapping array consisted of four arms (7.5 m in length) arranged in a cross pattern. A trap was placed at the outside edge of each arm and a 19 liter bucket in the center. We sampled these arrays from June 18 to July 31, 1994. Trapping was supplemented with coverboards (2' X 4' pieces of 3/8" plywood) placed in the center of one array per site. Two additional coverboards were placed at Benton Meadows near Large Pond and two more were placed in a rocky grassland habitat near the Salmon River Road.

In 1995, we set-up six portable drift fence arrays, using the same four-arm design as described above. The six arrays were placed in two habitat types, riparian and talus rocky-grassland. Three arrays were placed along the Snake River and three on the Salmon River. The Salmon River arrays were opened May 26, closed July 23, and checked every 3-4 days. Two of the Snake River arrays were opened June 15, and the other array was opened May 24. Because capture rate was low, we temporarily closed

all 3 arrays from July 10-20. We reopened the traps on July 20, and permanently closed them on July 29. The two remaining coverboards from 1994 (Benton Meadows, Salmon River) were also checked periodically (See Appendix C).

Road Driving

In 1994, on some spring days following a rain, Llewellyn drove many of the roads on Craig Mountain. These include: Waha Road, Soldiers Meadow Road, Deer Creek Road, 540 Road, Salmon River Road and a section of the Snake River Road between the mouth of Madden Creek and Billy Creek at night to observe and record amphibians and reptiles. In 1995, road driving was only conducted on the Snake River and Salmon River Roads (See Appendix D).

Calling Surveys

During night road driving surveys, Llewellyn would also stop at wetland and pond areas to listen for calling treefrogs. This was the most effective sampling technique for this species. An acoustic monitoring system (FrogLogger) was set-up at Benton Meadows in April to record calling frogs, but the tape recorder did not function properly because of the low temperatures. A Campbell Scientific CR 10 datalogger was placed at the Large Pond in Benton Meadows to measure air, soil, and water temperatures. We did not conduct calling surveys and road driving at the upper elevation habitat in the spring of 1995, but did conduct summer road drives several times along the Salmon River Road (See Appendix D).

Terrestrial Surveys

In 1995, we conducted several terrestrial surveys in areas not sampled in 1994. In particular, the grassland breaks along the Snake River and beach habitat along the rivers. Surveys entailed walking along a road or trail visually searching for animals and turning over rocks and logs. We

documented our start and end time, and note the animals encountered. Animal measurements were taken when possible (See Appendix D for data).

Incidental Observations

We compiled all incidental observations of amphibians and reptiles on Craig Mountain for the 1993, 1994 and 1995 field seasons. Frances Cassirer collected the 1993 observations from IDFG and Nature Conservancy personnel. Contributors of the 1994 and 1995 sightings included: IDFG, Lewis and Clark State College, and Idaho State University personnel (See Appendix E).

Mapping

We used PC ARC-INFO and Arc-View 2.1 for Windows (Environmental Systems Research Institute, Inc., Redlands, CA) to generate dot-distribution maps of the CM amphibian and reptile species observed during 1994 and 1995. We also generated a map to show the location of the 55 ponds and amphibian species found breeding in them, and maps showing the location of all amphibian and reptile sightings in 1993 and 1994. To obtain coordinates for the roads on these maps, we used a 36" x 48" CalComp 9500 digitizing table (CalComp, Scottsdale, AZ) and Sigmascan software (Jandel Scientific, Inc., San Rafael, CA).

Several steps were required to prepare maps of the amphibian and reptile observations from the 1994 and 1995 field surveys. While in the field, we marked the locations of pond locations on copies of USGS 7.5 minute series topographic maps (Frye Point, Waha, Rattlesnake Ridge, Hoover Point, Limekiln Rapids, Winchester West, and Wapshilla Creek). The maps were scanned in as 16-color halftone images at 180 dpi with normal sharpening, and saved as TIFF files. The TIFF files were then imported into Corel Draw 4.0 (Corel Corporation, Ottawa, Ontario, Canada). We added the site numbers and abbreviations for the amphibian and reptile species observed, and then printed the maps with an Epson Color Stylus printer at 360 dpi.